



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/817,140	04/02/2004	Ki-Ho Baik	AM-8893	1497
7590	07/25/2007		EXAMINER	
Patent Counsel APPLIED MATERIALS, INC. Legal Affairs Department P.O. Box 450A Santa Clara, CA 95052			RAYMOND, BRITTANY L	
			ART UNIT	PAPER NUMBER
			1756	
			MAIL DATE	DELIVERY MODE
			07/25/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/817,140	BAIK ET AL.
	Examiner Brittany Raymond	Art Unit 1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 30 April 2007.
 2a) This action is FINAL. 2b) This action is non-final.
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1-17 is/are pending in the application.
 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
 5) Claim(s) _____ is/are allowed.
 6) Claim(s) 1-17 is/are rejected.
 7) Claim(s) _____ is/are objected to.
 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.
 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) Notice of References Cited (PTO-892)
 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
 3) Information Disclosure Statement(s) (PTO/SB/08)
 Paper No(s)/Mail Date _____

4) Interview Summary (PTO-413)
 Paper No(s)/Mail Date _____
 5) Notice of Informal Patent Application
 6) Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

2. Claims 1-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kirkpatrick (U.S. Patent Application 2006/0084229) in view of Itoh (U.S. Patent Application 2004/0058279).

Kirkpatrick discloses a method for fabricating a semiconductor device comprising: depositing and patterning a photoresist layer over a substrate (Paragraph 0038) and subjecting the developed substrate (See Figures 3A-3F) to a vacuum ranging from $1e^{-3}$ Torr to $1e^{-8}$ Torr (Paragraph 0039), which is equal to 1 mTorr to $1e^{-5}$ mTorr and is within the range recited in claim 1 of the present invention. Kirkpatrick also discloses that the time the substrate is held in the vacuum ranges from 2 minutes to 60

minutes and the temperature of the vacuum may range from 20 degrees Celsius to five degrees less than the glass transition temperature of the photoresist used (Paragraph 0039), which are within the ranges recited in claims 2, 3, 10, 11 and 14 of the present invention. Subjecting the developed substrate to a vacuum under these conditions also meets the limitations of claims 8 and 14 of the present invention.

Kirkpatrick fails to disclose that the imaged photoresist can be exposed to a vacuum prior to development, and the type of radiation used during imaging.

Itoh discloses a pattern formation method comprising: providing a substrate coated with a chromium film and a resist on top (Paragraph 0057), baking the substrate for ten minutes (Paragraph 0058), writing on the resist film with an electron beam writing apparatus (Paragraph 0058), post exposure baking the substrate for fifteen minutes and developing the resist film (Paragraph 0060), as recited in claims 9 and 15 of the present invention. Itoh discloses that the substrate is left to stand in a vacuum after the writing step (Paragraph 0065), which is before the post exposure baking and developing steps, as recited in claims 6, 7, and 9 of the present invention. Itoh also discloses that along with the electron beam radiation, used in the process above, ultraviolet radiation, which is a type of optical radiation, can be used to pattern a resist, as recited in claims 4, 5, 12, 13, 16, and 17 of the present invention.

It would have been obvious to one of ordinary skill in the art, at the time of invention by applicant, to have performed the vacuum exposure step of Kirkpatrick prior to development, as suggested by Itoh, because Itoh teaches that performing the photolithographic process in a specific order allows for a more accurate resist pattern to

be formed according to the desired dimensions. It would have also been obvious to have used electron beam or optical radiation, as suggested by Itoh, because Itoh teaches that these are commonly used in patterning resists and they also help to efficiently produce a desired pattern size.

Response to Arguments

3. Applicant's amendments have overcome the rejections of claims 4, 5 and 9-17 under 35 USC 112 2nd paragraph that were presented in the last Office Action. Examiner has withdrawn the rejections.

4. Applicant's arguments filed 4/30/2007, of the prior art rejections, have been fully considered but they are not persuasive. Examiner has combined the references Kirkpatrick and Itoh to reject claims 1-17 in view of Applicant's amendments.

Applicant argues that their invention was made prior to the filing date of the Kirkpatrick reference. However, Applicant did not file a declaration swearing behind this and Examiner will continue to use the Kirkpatrick reference for the following reasons.

Applicant argues that the Kirkpatrick reference was not related to the present invention because the intended purpose for the use of a vacuum in Kirkpatrick was different from that of the present invention. The vacuum in Kirkpatrick is being used at the same conditions as those in the present invention. Although, the purpose for the use of the vacuum in Kirkpatrick is different, the same process, as recited in the present invention, is being performed. Since the same process under the same conditions as the present invention is being performed by Kirkpatrick, it is possible for the photoresist to equilibrate as well as accelerant residue to be removed. Applicant also states on

page 12 of the arguments, that in one embodiment of the present invention, the vacuum is used to removed irradiation reactant by-products, which is the same purpose of the use of the vacuum in Kirkpatrick.

Applicant also argues that the applications are not similar because the present invention is teaching a mask fabrication method while the Kirkpatrick reference is teaching semiconductor device fabrication method. The processes that are used to make a mask and a semiconductor device are very similar because they both use photolithographic processes to pattern a photoresist layer on a substrate.

The reference, Itoh, is being used to teach that the photoresist can be exposed to a vacuum *prior* to development, rather than after development, as taught by Kirkpatrick. Applicant argues that Itoh and Kirkpatrick cannot be combined because they relate to different subject matter. As discussed above, the processes for forming a mask and a semiconductor device are very similar because they both pattern a photoresist layer. Applicant also argues that the timing of the vacuum is different in the two references. Examiner has used Itoh to teach that the vacuum can be used at a different time in the process, than what is taught in Kirkpatrick, in order to form a desired pattern.

Applicant argues that the vacuum in Itoh is not being used to affect the size of the photoresist pattern, but rather that the dissolution inhibiting groups in the photoresist are causing this change. While this may be the case, Itoh teaches that after exposure of the photoresist layer, the photoresist is allowed to stand in a vacuum so that the dissolution inhibiting groups can react with one another to form a pattern with accurate critical dimensions. In other words, the photoresist is left to stand in a vacuum after

exposure, so that the imaged critical dimensions can equilibrate, as recited in the present invention.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

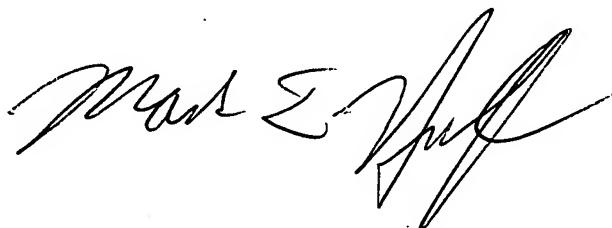
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brittany Raymond whose telephone number is 571-272-6545. The examiner can normally be reached on Monday through Friday, 8:00 a.m. - 4:30 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1756

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

blr



MARK F. HUFF
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700